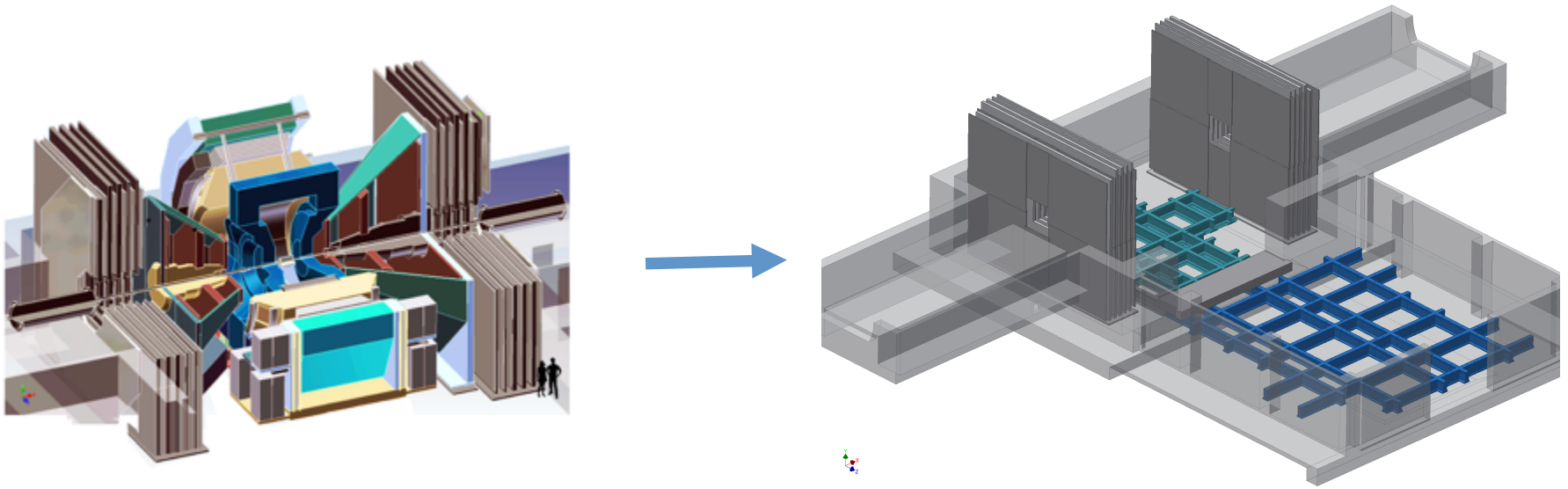
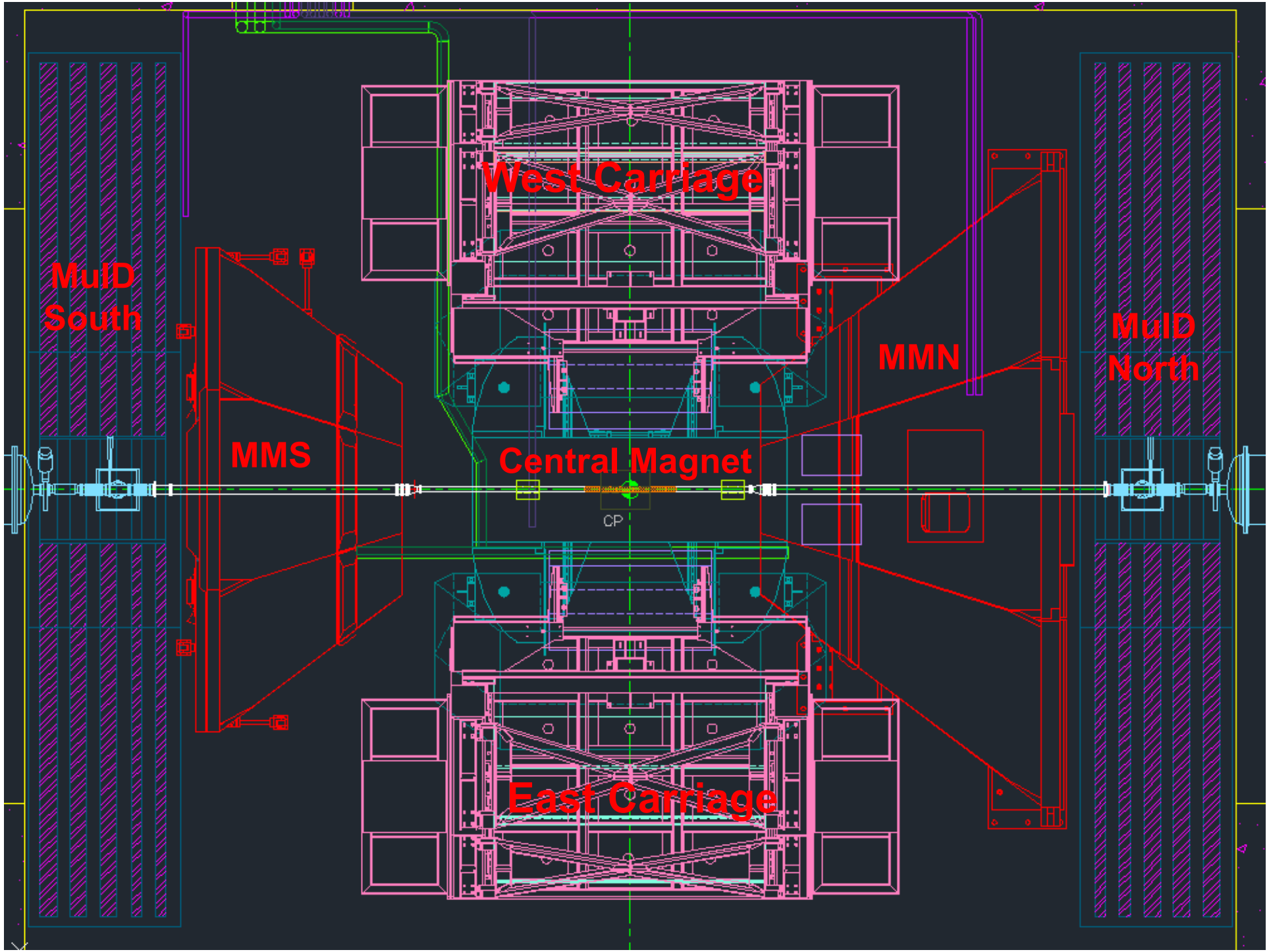
# Decommissioning PHENIX



Director's Cost and Schedule Review

November 9-10, 2015


West Carriage
MuID South
MMS
Central Magnet
CP
MMN
MuID North
East Carriage

# Decommissioning Specifications/Requirements

- **Remove and disposition** all PHENIX carriages and all PHENIX detector subsystems and services comprising, salvage high value components
- **Cap off** PHENIX gas system supply piping for future use
- **Re-use** as much Infrastructure as possible
- **Retain** shield walls, moveable and permanent and Muon Identifier (MuID) Steel
- **Remove** PHENIX Current beampipe, replace with temporary beampipe for future RHIC runs without PHENIX

# Decommissioning Description

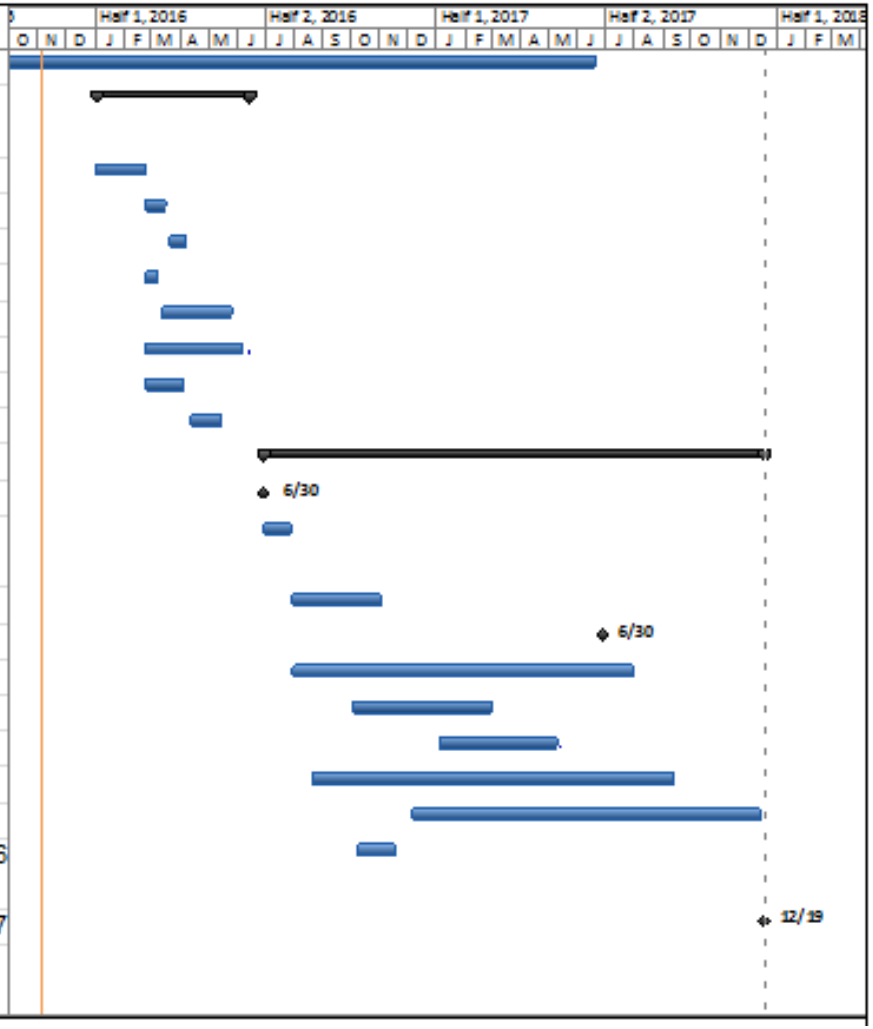
- **Obtain permission to Decommission PHENIX**
- **Prepare for Decommissioning**: work plans, determine disposition of Non-PHENIX/DOE equipment, re-certify lifting fixtures, contracts for disassembly and disposal, Set up work/ storage space for salvage parts
- **Initial Tasks**: Purge, disconnect, remove collars, move South Magnet (MMS) south, move EC to Assembly Hall (AH), start beampipe removal
- **Disassembly and Disposition**: For each major segment of PHENIX (EC, ), strip off services, remove racks, remove & dispose detector subassemblies, disassemble and dispose of frames, structural supports, access and platforms
- **Other** : Strip back and cap off services, decommission in place Infrastructure systems to be (or potentially to be) modified in the future Muon Identifier steel and detector panels, remove beampipe sections to safe storage for later modification and installation in sPHENIX. Install temporary beampipe and supports for Run 17 and Energy Scan runs.

# Decommissioning Cost and Schedule Drivers

- **Major Cost Drivers**
  - Lifting Fixture refurbishment/replacement
  - Storage area prep/infrastructure
  - Purchased services and rental equipment (cranes) for structural disassembly
  - Technician Labor
- **Major Schedule Drivers**
  - Approval to decommission
  - Availability of technician support
  - RHIC Run 16 (last PHENIX run, no access to IR)
  - RHIC Run 17 (PHENIX partially decommissioned, no access to IR)
  - Availability of purchased labor/services

# Decommissioning Schedule

| ID | WBS | Task Name | Start |
|---|---|---|---|
| 1 | 2.1.1 | Subsystem Project Management | 10/1/15 |
| 2 | **2.1.2** | **Decommissioning Engineering, Prep and Planning** | **1/4/16** |
| 3 | 2.1.2.1 | Decommissioning Plan | 1/4/16 |
| 4 | 2.1.2.2 | Lifting Fixture identification/design | 2/25/16 |
| 5 | 2.1.2.3 | Lifting Fixture certification | 3/22/16 |
| 6 | 2.1.2.4 | Storage area identification | 2/25/16 |
| 7 | 2.1.2.5 | Storage area prep | 3/14/16 |
| 8 | 2.1.2.6 | Outside labor and equipment procurement | 2/25/16 |
| 9 | 2.1.2.7 | Work Permits and Procedures | 2/25/16 |
| 10 | 2.1.2.8 | Design and Safety Reviews | 4/14/16 |
| 11 | **2.1.3** | **PHENIX Disassembly and Disposition** | **6/30/16** |
| 12 | 2.1.3.1 | End of Run 16 | 6/30/16 |
| 13 | 2.1.3.2 | Initial Tasks to prep for Decommissioning after run 16 | 7/1/16 |
| 14 | 2.1.3.3 | Dismantle EC | 8/1/16 |
| 15 | 2.1.3.4 | End of Run 17 | 6/30/17 |
| 16 | 2.1.3.5 | Remove and Preserve Beampipe | 8/1/16 |
| 17 | 2.1.3.6 | Dismantle MMS | 10/4/16 |
| 18 | 2.1.3.7 | Dismantle CM | 1/5/17 |
| 19 | 2.1.3.8 | Dismantle WC | 8/22/16 |
| 20 | 2.1.3.9 | Dismantle MMN | 12/8/16 |
| 21 | 2.1.3.10 | Decommission IR and Non-IR Support Structures | 10/10/16 |
| 22 | 2.1.3.11 | Decommissioning Complete | 12/19/17 |
| 23 | | Assemble base, carriage alignment and carriage roller supports | 5/22/19 |



# Decommissioning Engineering, Prep and Planning

- Liaison Engineer and Physicist
- Lifting Fixtures, Scaffolding, Equipment Required to Disassemble
- Work Plans for Disassembly
- Contracts for Disassembly and Disposal
- Specify and Prepare Storage Areas
- Determine Disposition of Non-PHENIX/DOE Equipment

~6 months: Jan ’16 – June ’16

# Initial Tasks Following Run 16

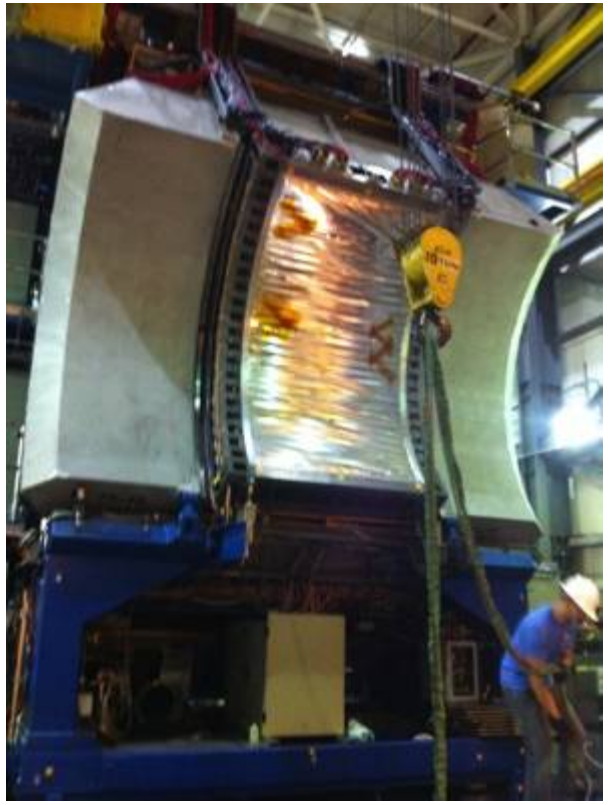
- Purge Flammable Gas & Disconnect Gas Lines
- Open & Remove Shield Wall
- Remove MuID Collars
- BP disassembly Part 1: Remove south spool
- MMS move south
- BP disassembly part 2: South bellows and 3" to 40 mm transition
- Remove dumbwaiter & ladder, fold Platforms
- Disconnect EC
- Move East Carriage to AH
- Un-fold EC Platforms
- Move MuId Collars to AH and dispose

~4 weeks: July ’16

# Disassemble East Carriage

- Remove EC Experimental Cables
- Strip unwanted Electronics from EC Racks
- Move EC Electronics Racks to Storage
- Remove and dispose DC East & PC1 East
- Remove and dispose PC3 East & TEC
- Remove and dispose RICH East (save PMT's)
- Remove and dispose EM Cal: PbSC East, PbGl
- Remove and dispose TOF-E
- Remove EC Tray, Power Cables & Lights
- Strip EC Copper Gas & Water Lines
- Remove EC Platforms
- Remove EC Steel Frame
- Disposal/Storage of EC Materials

~14 weeks: Aug – Nov ’16



# Disassemble Muon Magnet South

- Move MMS to AH with5" to 3" Beam Pipe
- Remove 5" to 3" transition BP spool, move to storage
- Strip unwanted Electronics from MMS Racks & Dispose
- Move MMS Racks to Storage
- Remove Experimental Cables
- Remove all MMS Tray, Power Cables & Lights
- Remove MuTrigger Platform & Dispose
- Remove Eyebrow Platform & Dispose
- Remove and store MPC-Ex South
- Remove and store MPC South
- Remove and dispose MuTr station 1 South
- Remove MMS Upper 5 Lamp Shades
- Build MMS Access Scaffold
- Remove MMS Exp Cables
- Remove & Dispose MuTr Stations 2 & 3 South & Support Structure
- Remove MMS Internal Work Platforms
- Remove MMS Cooling Water Piping & Hosing
- Remove MMS Teacup
- Remove MMS Coils
- Disassemble MMS Steel & Lead (all pieces under 40T)
- Disposal/Storage of MMS Materials

~21 weeks: Oct ’16 – Mar ’17

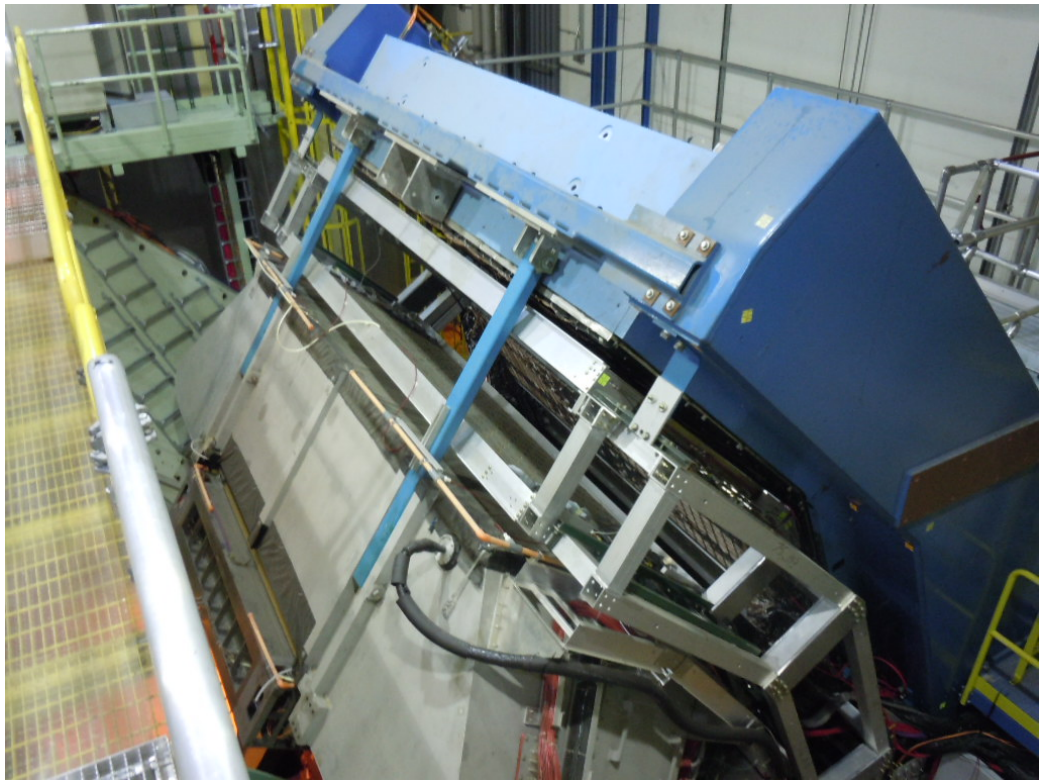
# Disassemble Central Magnet

- Move CM south
- BP Disassembly - Be BP, N 3" to 40 mm transition & N bellows
- Remove and store F/VTX
- Remove and dispose RPC1 North and South
- Remove and dispose BBC North and South
- Strip unwanted Electronics from CM Racks
- Move CM Electronics Racks to Storage
- Move CM to Assembly Hall
- Remove Experimental Cables
- Remove all CM Tray, Power Cables & Lights
- Remove and dispose Bridge platform
- Remove and dispose RPC stainless shields
- Remove CM Cooling Water Piping & Hosing
- Remove CM Platform
- Disassembly of CM Steel (Gantry Crane)
- Disposal/Storage of CM Materials

~19 weeks: Jan ’17 – May ’17

# Disassemble West Carriage

- Disconnect WC Services
- Roll WC to Assembly Hall
- Strip unwanted Electronics from WC Racks
- Move WC Electronics Racks to Storage
- Remove and dispose DC West & PC1
- Remove and dispose RICH West
- Remove and dispose EM Cal: PbSC West
- Remove Experimental Cables
- Remove WC Tray, Power Cables & Lights
- Strip WC Copper Gas & Water Lines
- Remove WC Platforms
- Remove WC Steel Frame
- Disposal/Storage of WC Materials



~16 weeks: Aug ’16 – Sept ’16 and July ’17 – Sept ’17

# Disassemble Muon Magnet North

- Strip unwanted Electronics from MMN Racks
- Move MMN Electronics Racks to Storage
- Remove Experimental Cables
- Remove all MMN Tray, Power Cables & Lights
- Remove MuTrigger platform and dispose/recycle
- Remove Eyebrow platform and dispose recycle
- Remove and dispose MPC-Ex North
- Remove and dispose MPC North
- BP disassembly: Remove North 3" to 5" transition BP spool
- Remove and dispose MuTr station 1 North
- Remove MMN Lamp Shades
- Build MMN Access Platform
- Remove and dispose MuTr stations 2 and 3 North
- Remove MMN Access Platform
- Remove MMN Cooling Water Piping & Hosing
- Remove MMN Detectors
- Remove MMN Teacup
- Remove MMN Coils
- Remove MMN Piston (Gantry Crane)
- Disassembly of MMN Steel
- Disposal/Storage of MMN Materials

~28 weeks: Dec ’16 and July – Dec ’17

# Decommission Support Structures

- Remove all MuID detectors not entrapped in MuID steel and dispose
- Remove and dispose all obsolete piping, wiring and fibers
- Cut Hole in MuID Steel for eRHIC Bypass ?
- Disconnect Power Supply Cables & Water
- Remove Power Supplies
- DAQ room Decommissioning
- Gas Mixing House Decommissioning
- Gas Pad Decommissioning


Oct - Nov ’16

# Example of Similar Removal – E949


# Decommissioning: Technical Status

- **Decommissioning** –
  - All requirements are well known
  - Planning, procedures and scheduling are in progress
  - Collection and evaluation of existing subsystem lifting and handling fixtures in progress

# Alternatives Considered

- **Decommissioning**
  - **Salvage vs. bulk recycle**– *high value items requiring minimal additional efforts to be salvaged all else to be bulk recycled*
  - **Cutting large MMN components in IR** vs. bringing in large crane and hauling out large MMN pieces – *cutting in IR is more cost effective*
  - Removing MuId Steel vs. retaining – *retaining eliminates costly removal and **is essential** to background shielding for sPHENIX detectors*

# Decommissioning Issues and Concerns

- **Decommissioning**
  - Waste management of **activated steel**
  - Disassembly of the **MMN** in the IR
  - Disassembly of the CM in the AH: Central magnet components exceed 1008 **crane capacity**
  - Final disposition of scrapped materials
  - In-house vs. **outside contractors** for disassembly of large structures